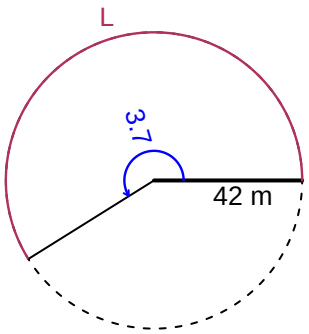
Name: Date:

Trig Final (SLTN v604)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 3.7 radians. The radius is 42 meters. How long is the arc in meters?

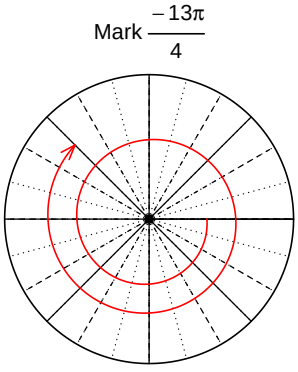


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

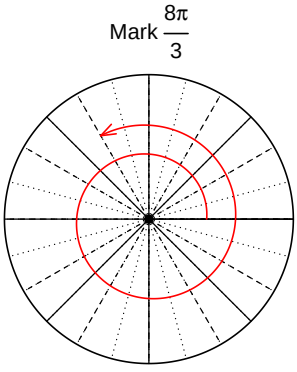
$L = 155.4$ meters.

Question 2

Consider angles $\frac{-13\pi}{4}$ and $\frac{8\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-13\pi}{4}\right)$ and $\cos\left(\frac{8\pi}{3}\right)$ by using a unit circle (provided separately).



Find sin(−13π/4)



Find cos(8π/3)

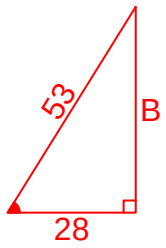
$\sin(-13\pi/4) = \frac{\sqrt{2}}{2}$

$\cos(8\pi/3) = \frac{-1}{2}$

Question 3

If $\cos(\theta) = \frac{-28}{53}$, and θ is in quadrant III, determine an exact value for $\tan(\theta)$.

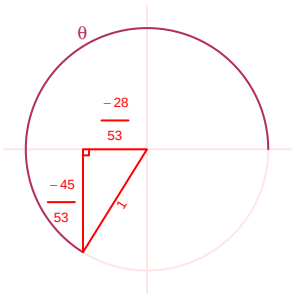
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$28^2 + B^2 = 53^2$$
$$B = \sqrt{53^2 - 28^2}$$
$$B = 45$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\tan(\theta) = \frac{\frac{-45}{53}}{\frac{-28}{53}} = \frac{45}{28}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 2.34 meters, a frequency of 8.82 Hz, and a midline at $y = -5.45$ meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -2.34\sin(2\pi 8.82t) - 5.45$$

or

$$y = -2.34\sin(17.64\pi t) - 5.45$$

or

$$y = -2.34\sin(55.42t) - 5.45$$